NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION

Office of Public Affairs Telephone: 301/415-8200
Washington, DC 20555-001 E-mail: opa@nrc.gov
Web Site: http://www.nrc.gov/OPA

No. S-00-23 October 23, 2000

Remarks of
Dr. Richard A. Meserve
Chairman
U.S. Nuclear Regulatory Commission

"THE ROLE OF RESEARCH IN A CHANGING ENVIRONMENT"

WATER REACTOR SAFETY
INFORMATION MEETING

28th Annual Meeting
Bethesda, Maryland

Good morning. It gives me great pleasure to add my welcome to all of you. This is the 28th year that the Water Reactor Safety Information Meeting has been held, but it is the first that I have had the pleasure of attending. I am pleased to be able to address this opening session, particularly since the panel on the WASH-1400 study that follows this talk includes several friends. I am looking forward to hearing their reflections on that landmark effort.

The topic of my talk this morning is "The Role of Research in a Changing Environment." I hope to give you a sense of where I see the nuclear industry heading over the next several years, what the change means for the Nuclear Regulatory Commission, and the essential and vital role that research must play in ensuring that the NRC is equipped to deal with the challenges ahead.

The Changing Environment

The electric utility industry as a whole, and the nuclear sector of that industry in particular, is encountering a period of profound change. For the nuclear industry, the current turbulence is certainly greater than at any time since the Three Mile Island accident, and it may be unequaled in the history of civilian nuclear power electric production. The driving force for these changes is the deregulation of electricity pricing. In a competitive and deregulated market, the economics of generation is the essential consideration, and reliable nuclear power plants – particularly those for which the capital costs have been largely amortized – have become increasingly valuable assets. The changed view of nuclear generating assets is driving a number of initiatives: industry consolidation, plant sales, and license

renewal. We are even beginning to see the first stirring of interest in construction of new nuclear power plants in the United States. These developments have significant implications for the NRC in general, and for our research program in particular.

The Role of Research in the Near Term

In the near term, NRC-sponsored research has a key role in developing the regulatory tools that the NRC will need to deal with the changing environment. The industry's focus on economics has a number of potential consequences. During a time of change, it is important to maintain vigilance so as to assure that safety is maintained. I am optimistic, however, that the changed economic circumstances could in fact lead to safety improvements. Industry consolidation has the potential to enhance nuclear plant safety as companies with many plants apply best practices and lessons learned across their entire fleets. Perhaps even more important is the reality that safe operation and economic operation should go hand-in-hand. A safe and well-run plant is reliable, stays on-line, and is able to avoid extended shutdowns, either as a result of the need to fix problems or because of regulatory action on the NRC's part to address a significant safety deficiency.

How do these developments affect the NRC? The NRC's statutory mandate, and our foremost obligation, is to provide reasonable assurance of adequate protection of public health and safety and the environment. We must never allow economic considerations to compromise our commitment to fulfill that obligation. However, that does not mean that we should not strive to operate as efficiently and effectively as possible. The price deregulation of the electric generation business means that the cost of safety regulation – both direct, from fees charged to licensees to recover the cost of the NRC's operations, and indirect, from the costs of regulatory compliance – come directly off the bottom line. Just as we owe the public the assurance that their health and safety are protected, we owe our licensees the assurance that the regulatory obligations that we impose on them minimize unnecessary burdens. We must therefore sharpen our focus to those areas that are safety-significant.

As you are undoubtedly aware, the NRC has embarked on a fundamental re-examination of our reactor regulations to consider risk explicitly. This move to risk-informed regulation builds on the foundation that has been established through NRC-sponsored research, beginning with the WASH-1400 study and continuing to the present day, to develop and apply quantitative methodologies for the assessment of reactor risk. The current focus of the agency's efforts in this area include risk-informing the technical bases of our reactor regulations and supporting the efforts to risk-inform the so-called "special treatment" requirements, such as quality assurance, environmental qualification, and technical specifications. We have also made substantial changes in our reactor oversight program, with a focus on safety and objectivity. Our research programs support these initiatives through evaluation of plant operational experience and development of risk-based performance indicators, thereby helping us to sharpen the safety focus of the oversight process.

The process of risk-informing our regulations requires that our tools for assessing technical issues be as realistic as possible. This move away from a traditional conservative, bounding approach has been made possible through a combination of operating experience, which now comprises more than 2000 reactor years in the U.S. alone, and experimental and analytical programs nurtured by NRC-sponsored research to develop better models of the behavior of a reactor during design-basis and beyond-design-basis accidents. One recent product of this research was an NRC-approved alternate source term for more realistic assessment of radiological consequences. Other ongoing research programs in this same vein include upgrading of the NRC's thermal-hydraulic codes to support review

of industry-sponsored "best-estimate" accident analysis codes, and revisions to the pressurized thermal shock rule, based on a better understanding of radiation-induced embrittlement and fluid-structure interactions in reactors.

The drive for improved economic performance of operating plants is also manifesting itself in other ways. One outgrowth of the application of more realistic analyses is that the margins between calculated plant conditions and operational or regulatory safety limits are larger than previously demonstrated. Licensees are naturally inclined to make use of these additional margins in ways that allow improved economic performance, such as by increasing fuel burnups, changing core power distributions, and increasing reactor power. (We refer to these as power uprates.) The research program on high-burnup fuels, along with the improved analytical techniques for accident analyses, are essential elements of the NRC's capability to review such initiatives. Licensees are also bringing on-line new technologies, such as digital I&C systems, that have the potential to increase plant reliability; the programs to assess the potential impacts of these new technologies are needed to ensure that the NRC is not an impediment to the appropriate deployment of these technologies.

The developments that I have just covered are extremely important both to the industry and to the NRC. However, I believe that the most significant near-term impact of the new environment is the widespread interest in nuclear plant license renewal. A few years ago, pundits claimed that a large number of nuclear plants would shut down prematurely. But the changed economic circumstances now make it worthwhile for a generating company to take steps to keep a plant operating beyond the term of the original 40-year license if the plant can operate safely and reliably for an extended period. As a result, we are seeing a strong interest in license renewal. We have renewed the licenses of two plants, Calvert Cliffs and Oconee, and are currently reviewing the applications for three other plants -- Hatch, ANO-1, and Turkey Point. Five more applications are expected in the current fiscal year, and the number in the years beyond 2001 continues to grow. About 40 percent of operating plants have indicated their intention to seek license renewal, and that fraction may ultimately reach 85 percent or more. If license renewal can appropriately be granted, nuclear power from existing plants will continue to make a significant contribution to our energy supply well into this century.

The core question is whether license renewal is appropriate. Fortunately, the NRC has been working on various aging-related issues for many years. As a direct consequence of these research programs, we have the technical bases to approach license renewal in a manner that focuses appropriately on the effects and management of aging. We were able to complete comprehensive assessments of the first two applications that we received for license renewal within the targeted schedule of 30 months. The challenge is to maintain this record as more applications are submitted. I believe we are up to the challenge, with the help of the tools that the NRC research program has helped to provide. As you may know, the NRC recently published its Generic Aging Lessons Learned, or GALL, report, reflecting insights gained as a result of our work to date on license renewal. (The report is available on the NRC's website.) There were many contributors to this important compilation of lessons learned, but a significant portion of the information is derived from reports prepared as part of our Nuclear Plant Aging Research Program. Without that technical foundation, I suspect that we would not be in the position to respond to the applications for license renewal with the depth of knowledge that we can now bring to bear.

<u>Long-Term Developments and the Role of Anticipatory Research</u>

I have concentrated thus far on areas that are of current or near-term interest to the industry and the NRC. Now, I would like to take out my crystal ball and speculate about what the future might hold for the industry, and discuss how the NRC's research programs with a longer-term focus support future NRC regulatory needs.

The overall environment for nuclear power is changing, in addition to the economic environment. Concern about global warming, for example, should focus attention on power technologies, such as nuclear, that minimize the emission of carbon dioxide and other potential "greenhouse gases." Similarly, consideration of energy security is seen to justify the support of a portfolio of energy technologies. The renewed interest in such matters may bring about a national reconsideration of the role of nuclear technology.

Perhaps as a natural reflection of these changes, the Department of Energy has begun to increase its research expenditures for civilian nuclear power technology after a period of essentially zero funding. The current program has several components. The Nuclear Energy Plant Optimization program, or "NEPO," focuses on existing plants, with research projects to develop new technologies to increase reliability, availability, and efficiency. By contrast, the Nuclear Energy Research Initiative, or "NERI," is to overcome scientific and technical obstacles to the future use of nuclear energy in the U.S. Many of the projects in the NERI program involve what is referred to as "Generation IV" reactor designs -- plants that might offer improved safety, lower capital and operating costs, proliferation resistance, and reduced waste production. A separate Nuclear Engineering Education Research (NEER) Program has funds that are earmarked for university research; a number of the projects supported by this program also deal specifically with advanced reactor concepts and related technology.

What might all of this mean for the future use of nuclear power? Again, I must offer an impressionistic and distant view. The NRC does not have a promotional role, and must remain agnostic on the question of whether the nuclear path should be resuscitated. Nonetheless, we must watch developments so that our processes do not serve as a needless impediment. As I said earlier, we are beginning to see the first stirring of interest among our licensees in constructing new plants. Given these circumstances, the NRC must prepare to deal with future demands.

Several years ago, we developed a licensing process for standardized plant designs. The idea was to permit the certification of a design in a fashion in which many key technical issues could be resolved once and for all, thereby stabilizing and streamlining the plant licensing process. An application to build a plant based on a certified design would not require examining issues that had been resolved during the certification. Upon approval of such application, a single combined construction permit and operating license would be issued. We have certified three standardized plant designs: General Electric's Advanced Boiling Water Reactor, the System 80-plus design of Combustion Engineering, which is now under the BNFL umbrella, and Westinghouse's AP600 passive plant design, which is also now a BNFL product. We have recently begun a review of Westinghouse's AP1000 design for possible certification. We have not received any applications to build these plants in the U.S., but I must note that two ABWRs are operating in Japan, and several more are planned.

I would also like to mention that the confirmatory testing and analysis programs conducted by the Office of Research were a key element in the review of the AP600 design. While these projects were specific to the AP600 review, they also contributed to the more general objective of upgrading the

NRC's thermal-hydraulics codes, and initiated development of advanced risk assessment techniques that should ultimately contribute to risk-informed regulation for both current and future plants.

Some longer-term needs have already been defined for us. The end of the Cold War and the move toward reductions in nuclear weapons stockpiles have resulted in the need to manage significant amounts of weapons-grade plutonium. The strategy selected for this task involves using a portion of that material to create mixed-oxide fuel to be burned in commercial nuclear power reactors. We have already begun to prepare for the licensing of a MOX fuel fabrication plant, and have a research program to develop a technical basis for reviewing the license amendments that will be required to permit licensees to burn that fuel in their reactors.

Other longer-term issues are perhaps not so clear cut. We are following DOE's work on NERI and Generation IV reactors, so that we can understand the primary features of potential advanced reactor concepts. We recognize that our current reactor regulations may not translate well to the licensing of new reactor designs, particularly if the new designs are not water-cooled. Some of these issues may be resolved by our efforts to risk-inform our regulations, but, in other cases, the best approach may well be to start with a clean sheet of paper. This challenge is clearly a considerable one, but we must ensure that our research program has adequate resources to prepare us for the future. If we do not start now, we may find it extremely difficult to respond when we are called upon to begin to review these advanced designs.

Resources and Other Research Issues

My reference to "adequate resources" brings me to my next topic: research funding within the NRC. This is a subject that tends to generate a significant amount of discussion, especially among our licensees, since their fees currently pay our costs, including those for research.

Earlier this year, I spoke to a meeting of the Nuclear Energy Institute. The topic of the meeting was "change," and I stated that our research programs provide the basic technical capabilities that allow us to master change rather than to be its victim. I hope that I have conveyed throughout this talk how our research effort provides the technical "backbone" of the NRC's regulatory requirements. Our research program also plays a major role in maintaining the NRC's core technical competencies. This is essential not only from the standpoint of our relationship with our licensees, but also for developing and maintaining public confidence and trust in the NRC as a competent, technically knowledgeable regulator.

Despite the vital contributions of research to the NRC's activities, however, I must also acknowledge that over nearly the last two decades, the research budget has been significantly reduced. Accordingly, I – with the support of my colleagues on the Commission – have taken action to stabilize the budget to ensure that we have adequate resources for key research initiatives. I would also like to note that the bill containing the appropriation for the NRC's 2001 budget includes a provision to remove 10 percent of the NRC's total budget from our fee base, in 2 percent increments over a five-year period. We requested this provision in recognition that some of our activities, while valuable to the NRC's overall mission, do not directly affect the activities of our current licensees, but are of a more general benefit to the public. Instead of license fees, these funds would be supplied from general revenues. I am hopeful that this initiative will ease some of the pressure on our budget in future years.

The strain on the research budget is also occurring in other countries. Under such circumstances, international cooperation becomes essential so as to sustain major research initiatives that are beyond the means of any single country. We have many important international collaborations. I note that our international research partners are well-represented at this conference, and I would particularly like to acknowledge the contributions that you make to further our common understanding.

Our cooperative research efforts extend to the nuclear industry, as well. While we are mindful of the need to conduct independent assessments of important safety issues, there are times in which it is appropriate pool our resources and work with the industry to develop research programs. These include, for example, facility designs and test plans, with each party performing an independent analysis of the results. We have developed memoranda of understanding on the conduct of cooperative research with both the Electric Power Research Institute and the Department of Energy. I would like to acknowledge the value of these programs, as well.

We are also taking other steps to address the issue of resources and the broader question of the direction of the research program. A few months ago, we convened a group of experts drawn from a wide range of disciplines – academia, the nuclear industry, the public, Congressional staff, and other government agencies – to review the research program and provide suggestions regarding the role, funding, and focus of the research program. The initial reports of the participants were recently submitted and I very much appreciate the group's efforts. I note that several of the members of this group will be participating in a panel session on Wednesday morning to discuss their views on these important questions.

I have been able to touch upon only a portion of the research-related activities that are underway. Fortunately, some of the matters that I did not have time to address are the subject of later sessions. For example, you will hear presentations dealing with reactor decommissioning, dry cask storage, the transportation of spent fuel, and PWR sump blockage issues. The fact that I was not able to discuss these programs, and many others, in the course of this talk, does not mean that I ascribe any less value to them. I hope you will take the opportunity to learn about them first-hand during the remainder of the meeting.

Conclusion

Let me conclude by emphasizing once again the crucial role that our research programs play in meeting our current regulatory challenges and in preparing the NRC to deal effectively and efficiently with issues that may confront us in the future. Whether we are considering operating plants, new reactor designs that may be deployed a few years down the road, or other aspects of the nuclear power enterprise, such as decommissioning and waste disposition, we depend on the results of our research to establish the technical foundation for our regulatory activities. The organizational agility and responsiveness demanded by the rapidly changing environment in the electric utility industry is possible only if we have that firm technical foundation. I am proud of the past record of NRC's research efforts and am committed to sustaining the program in the future.

Thank you.